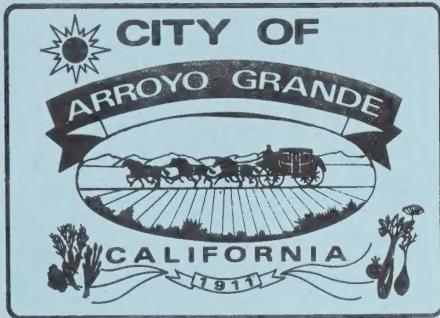


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NOISE

INSTITUTE OF GOVERNMENTAL
STUDIES

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CITY OF ARROYO GRANDE GENERAL PLAN

1986

NOISE ELEMENT

**SECTION 8.0 OF THE
ARROYO GRANDE GENERAL PLAN**

July, 1986



NOISE ELEMENT

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I. INTRODUCTION

A. Legislative Authority

The Legislature has recognized the steady escalation of outdoor noise as a significant environmental hazard. Noise is generated primarily by people, machines and vehicles. Considering noise in the planning process is essential to controlling its impact on the community.

Government Code Section 65302(g): A noise element, which shall recognize guidelines adopted by the Office of Noise Control pursuant to Section 46050.1 of the Health and Safety Code, and which quantifies the community noise environment in terms of noise exposure contours for both near and long-term levels of growth and traffic activity. Such noise exposure information shall become a guideline for use in development of the land use element to achieve noise compatible land use and also to provide baseline levels and noise source identification for local noise ordinance enforcement.

The sources of environmental noise considered in this analysis shall include, but are not limited to, the following:

1. Highways and freeways.
2. Primary arterials and major local streets.
3. Passenger and freight on-line railroad operations and ground rapid transit systems.
4. Commercial, general aviation, heliport, helistop, and military airport operations, aircraft overflights, jet engine test stands, and all other ground facilities and maintenance functions related to airport operation.
5. Local industrial plants, including, but not limited to, railroad classification yards.
6. Other ground stationary noise sources identified by local agencies as contributing to the community noise environment.

The noise exposure information shall be presented in terms of noise contours expressed in community noise equivalent level (CNEL) or day-night average level (L/dn). CNEL means the average equivalent A-weighted sound level during a 24-hour day, obtained after addition of five decibels to sound levels in the evening from 7 p.m. to 10 p.m. and after addition of 10 decibels to sound levels in the night before 7 a.m. and after 10 p.m. L/dn means the average equivalent A-weighted sound level during a 24-hour day, obtained after addition of 10 decibels to sound levels in the night before 7 a.m. and after 10 p.m.

The contours shall be shown in minimum increments of 5 dB and shall continue down to 60 dB. For areas deemed noise sensitive, including, but not limited to, areas containing schools, hospitals, rest homes, long-term medical or mental care facilities, or any other land-use areas deemed noise sensitive by the local jurisdiction, the noise exposure shall be determined by monitoring.

A part of the noise element shall also include the preparation of a community noise exposure inventory, current and projected, which identifies the number of persons exposed to various levels of noise throughout the community.

The noise element shall also recommend mitigating measures and possible solutions to existing and foreseeable noise problems.

The state, local, or private agency responsible for the construction, maintenance, or operation of those transportation, industrial, or other commercial facilities specified in paragraph 2 of this subdivision shall provide to the local agency producing the general plan specific data relating to current and projected levels of activity and a detailed methodology for the development of noise contours given this supplied data, or they shall provide noise contours as specified in the foregoing statements.

It shall be the responsibility of the local agency preparing the general plan to specify the manner in which the noise element will be integrated into the city or county's zoning plan and tied to the land use and circulation elements and to the local noise ordinance. The noise element, once adopted, shall also become the guideline for determining compliance with the state's noise insulation standards, as contained in the Section 1092 of Title 25 of the California Administrative Code.

The noise element must comply with the 1975 amendments and "recognize" the 1976 NOISE ELEMENT GUIDELINES. Of all general plan requirements, the noise element is the most specific in content and method of preparation. It seeks to protect residents from noise that would jeopardize their health or welfare. Because transportation systems and industry contribute greatly to noise problems in areas where there are homes, schools, and hospitals, the noise element should influence proposals for the type and location of land uses and transportation facilities in the land use and circulation elements. The noise element should further specify how noise policies and standards will be implemented through zoning and the local noise ordinances.

(1980, 1982 California General Plan Guidelines, OPR)

Noise contours shall be used as a guide for establishing a pattern of land uses in the Land Use Element that minimizes exposure of residents to excessive noise.

The Noise Element shall include implementation measures and possible solutions. It shall serve as a guideline for compliance with the State's noise insulation standards.

Conclusions regarding appropriate site or route selection alternatives or noise impact upon compatible land uses shall be included in the General Plan.

The state, local or private agency responsible for the construction or maintenance of such transportation facilities shall provide to the local agency producing the general plan a statement of the present and projected noise levels of the facility, and any information which was used in the development of such levels.

B. Purpose

The Noise Element serves as a guide in public and private development matters related to outdoor noise. The Element outlines a comprehensive plan to achieve and maintain a noise environment that is compatible with a variety of activities in

different land uses. To achieve this goal, the Element provides a 1975 quantitative estimate of noise exposures, land use noise standards, and goals, policies and programs designed to control noise. This is intended for use in conjunction with other elements of the General Plan, particularly the Circulation, Land Use and Housing Elements.

II. NOISE, BACKGROUND AND CURRENT DATA

A. General

Common noises may range from a whisper to a locomotive train passing by. The range of sound energy represented by these two events is so large that it cannot be represented mathematically without using numbers in the millions and billions. To avoid this inconvenience, sound levels have been compressed in a standard logarithmic scale called the decibel (dB) scale.

The reference level for the scale, 0 dB, is not the absence of sound, but the weakest sound a person with very good hearing can detect in a quiet place. The most important feature of the decibel scale is its logarithmic nature. An increase from 0 to 10 dB represents a tenfold increase in sound energy, but an increase from 10 to 20 dB represents a hundredfold increase, and from 20 to 30 dB represents a thousandfold increase over 0 dB. The average range of sounds that we are exposed to generally falls in the 30 to 100 dB range. The human ear is more sensitive to high pitch sounds, such as a whistle, than it is to low pitch sounds, such as a drumbeat.

To account for this effect in noise measurements, it is necessary to use an electronic filter in sound level meters which acts as the equivalent of the human ear in filtering out some of the lower frequencies of sound. This filter is called the A-scale weighting network, and is abbreviated by the A in the notation dBA.

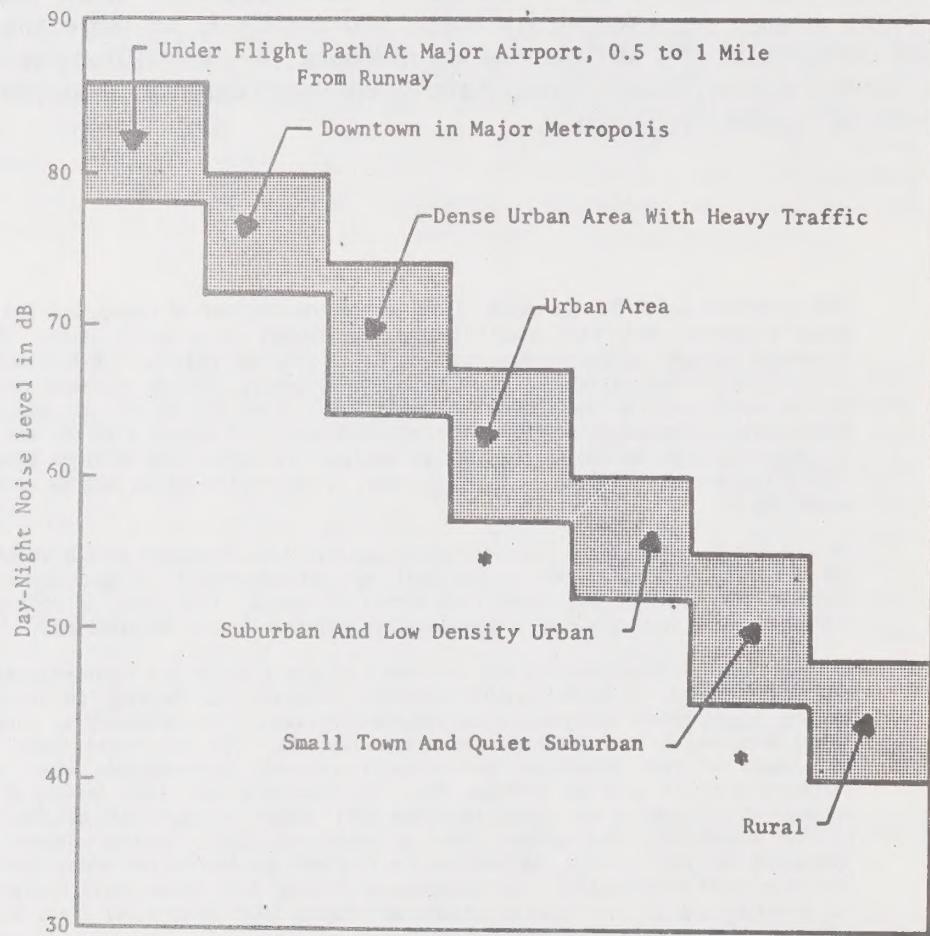
A-scale decibel measurements can be taken at any time in the community to record the sound levels of various noise sources. However, to develop an indicator of varying sound levels occurring over the 24-hour day, it is necessary to average the sound occurring at each moment throughout the day. The Day-Night Noise Level is the result of this procedure, and gives a general, single-number index of noise exposure over an average 24-hour day. In computing the L_{dn} levels, it is also necessary to apply a weighting to noise that occurs at night to account for the greater sensitivity that people have to noise at night. L-noise levels can be developed for road traffic, as well as for rail and air traffic for which the measure has been used traditionally. As examples of typical L_{dn} noise level ranges, Figure 8.1 gives ranges of L_{dn} decibel exposures ranging from quiet rural areas to an area under the flight path of a major airport.

B. Existing Conditions

The existing noise environments are composed of sounds from many sources. Under the scope of this Element, the noise sources evaluated were road, rail, and air traffic, and stationary noise sources. Hospitals, schools and parks were also evaluated as noise sensitive land uses to determine if potentially incompatible noise levels impinged on them. The following are summary conclusions regarding the existing noise environment in the City:

Figure 8.1

Typical L_{dn} Noise Level Ranges



* Arroyo Grande

(Source: Bolt, Beranek, and Newman, Inc., 1974)

The most significant source of noise is traffic noise, particularly Highway 101; Highway 227 and Grand Avenue have high noise levels, also. With the growing amount of traffic on City streets as documented by Figure 8.2, Traffic Volume, traffic noise will be an increasing problem to residents beyond the Highway 101 corridor, particularly the Grand Avenue/Haleyon Road intersection (see Figure 8.4). The expected increase in the number of noise sources (**traffic**) will affect the total noise level for the City. Traffic lights, truck routes and highways all produce elevated traffic noise levels.

The major change in neighborhood noise has been due to changes in **technology** since the writing of the Noise Element, 1976. New tools (leaf blowers), wider use of tools (chain saws, kitchen machines, spa and pool motors), increased use of amplifiers and sound magnifiers (radio "boxes"), electric musical instruments, vehicular sound systems, and computerized printers have raised the noise levels in and around homes and neighborhoods.

There are **more** vehicles on the State highways than ten years ago (1976), but **less noise per unit** (see Appendix 8.1). Stringent legislation is in place which demands that all manufacturers produce vehicles with quieter components, especially manifolds, mufflers and other exhaust components. The decline in noise of the new units has occurred over the successive time period 1976-1986. The biggest improvement in noise reduction has occurred for trucks and motorcycles.

Due to the lack of noise sources (airport, port facilities, train or train tracks) (heavy industry) in Arroyo Grande, these sources are not mentioned in this element. For information, consult Pismo Beach, Grover City, San Luis Obispo City, Santa Maria and San Luis Obispo County Noise Elements.

1. **Noise Sensitive Land Use:** Following is a list of those noise sensitive land uses which were found to be exposed to potentially incompatible noise levels according to the land use standards. The incompatibility is termed potential because the land use was evaluated only at a general level. Site acoustic analysis is necessary to determine the nature and extent of a noise problem, should one be confirmed to exist. Sources of the noise impinging on the land use or facility are traffic related.

Table 3.1 Community Noise Exposure Inventory

This mandated inventory identifies current and projected noise exposure to persons in hospitals, nursing homes, long-term medical or mental care facilities, congregate care homes and schools in the community. When a current noise monitoring of the City is completed, the noise level information must be added to this matrix. (L/dn - 1990)

A. Noise Sensitive Use (Medical/Mental or Residential Care)	# of Persons		L/dn	
	1985	1990	1975	1990
Arroyo Grande Community Hospital* (Fair Oaks and Halcyon)	79	N/A	50 to 60	
Manor Care (Future) (Camino Mercado)	180	180	55	
Patio Home Care (222 S. Elm St.)	99	99	50 to 55	
South County Convalescent Center (1212 Farroll Road)	25	25	45	
Alder House (295 Alder Ave.)	11	11	50 to 55	
Ruth Vogan (1121 Sunset Drive)	6	6	55 to 60	

Note: Residential care facilities must be allowed in all R Zones (R-1, R-2, R-3) by State law. Demographic projections describe the need for more small (6-person) residential care facilities (1990-2000) in Arroyo Grande for individuals needing supportive services (meals, laundry, housekeeping), but not medical services.

* If helicopter/heliport use is proposed, acoustical engineering study must be completed before project can be accepted.

**A. Noise Sensitive Use
(Schools)**

Arroyo Grande High School (Fair Oaks and Valley Rd.)	2142	2185	50 to 65
Lopez Continuation School (Elm St., near Ash St.)	179	180	45 to 55
Paulding Intermediate School (Hwy. 227 west of Huasna Rd.)	536	N/A	50 to 60
Margaret Harloe School (Fair Oaks at Halcyon)	526	N/A	50 to 60

* NA - Information not available or criteria not applicable

Table 8.1 Community Noise Exposure Inventory (Continued)

		# of Persons			L/dn
		1985	1990	1975	
A. Noise Sensitive Use (Schools, Continued)					1990
Ocean View School (Linda Dr., 500 ft. west of Hwy. 101)	535	N/A	55		
Total Lucia Mar Unified School District (includes other cities and the County)	7545	9682	N/A		
St. Patrick's School (Private, West Valley, 500 ft. northeast of Hwy. 101)	313	320	55 to 60		
Central Coast Christian Academy (Private, Traffic Way)	140	N/A	55 to 60		
Valley View Adventist School (Private, Vernon St., 500 ft. northeast of Hwy. 101)	27	N/A	55		
Gospel Lighthouse (Fair Oaks and Valley Rd.)	35	35 to 60	50 to 65		
B. Noise Sensitive Land Uses (Residential)					
R-1, within 500 feet of Highway 101					
Arroyo Ave.					
Orchard St.					
Cherry Ave.					
Fair Oaks Ave.					
Pilgrim Way					
Fael Ave.					
Bennett Ave.					
Cornwall Ave.					
Bell St.					
Oak St.					
Vernon Ave.					
W. Branch St. (1 block west of Wesley St.)					
Larchmont Ave.					
El Camino Real (east and west of Hillcrest)					

Table 8.1 Community Noise Exposure Inventory (Continued)

B. Noise Sensitive Land Uses (Residential, Continued)	# of Persons		L/dn 1975	1990
	1985	1990		
R-1, within 150 feet of Grand Avenue Grand Ave.				
101 to Halcyon Road				
Halcyon to Elm Street				
Elm to westerly edge of the City				
R-1, within 150 feet of Valley Road				
R-2				
El Camino Real (east of Hillcrest)				
R-3				
El Camino Real (west of Hillcrest)				
RAB-3				
S. Traffic Way				
C-3				
Bed & Breakfast (El Camino Real)				
Vagabond Mobile Home Park (S. Traffic Way)				
Fair Oaks Avenue				
C. Noise Sensitive Land Uses (Parks, Open Space and Community Centers)				
Strother Park (Huasna Rd.)	N/A	N/A	N/A	
Soto Sports Complex (Ash St.)	N/A	N/A	45 & below	
Terra de Oro Park (Oro Dr.)	N/A	N/A	N/A	
La Barranca Park (Via La Barranca)	N/A	N/A	N/A	
Elm Street Park (S. Elm St.)	N/A	N/A	50 to 55	
Kiwanis Park (Bridge St., near E. Branch St.)	N/A	N/A	55	
Hoosegow Park (Le Point St.)	N/A	N/A	50	
Tiger Tail Park (Tiger Tail)	N/A	N/A	55	
Woodland Park (Woodland Dr.)	N/A	N/A	45	

Table 8.1 Community Noise Exposure Inventory (Continued)

C. Noise Sensitive Land Uses (Parks, Open Space and Community Centers, Continued)	# of Persons		L/dn	
	1985	1990	1975	1990
Dower Wayside (S. Traffic Way)	N/A	N/A	65	
Christmas Tree Park (Traffic Way)	N/A	N/A	60	
El Camino Wayside (El Camino Real)	N/A	N/A	65 to 70	
Greenbelt (Undeveloped) Arroyo Grande Creek				
Greenbelt (Undeveloped) Tally Ho Creek				
Open Space Oak Park Acres (Private)				
Arroyo Grande Women's Club and Community Center	N/A	N/A	60 to 65	
South County Regional Center and Library	N/A	N/A	60 to 65	

Note: All L/dn (day-night average level) numbers have been derived from the 1975 Noise Contour Map.

Residential areas are less crucial in relation to noise than hospitals or other medical care, 24-hour-a-day facilities, but more crucial than parks, which receive time limited use. Noise which is constant (freeway) is received as less bothersome than irregular noise (traffic stacking, braking, blaring radio). Residential areas are sensitive to noise which disturbs the sleep of the residents.

New noise sensitive uses should receive special attention by City staff and may require acoustical sound survey by acoustical engineers and mitigation measures prior to project acceptance. Existing conflicts between existing noise sensitive uses and traffic corridors may be encouraged to retrofit buildings to a lower noise level.

Judging by these criteria and the noise levels quantified in the text and the Technical Report, Arroyo Grande is relatively free of the effects of noise. Near major roads, however, these criteria indicate that a certain level of activity (i.e. sleep, speech) interference and stress can be expected.

2. Noise Criteria: Health and welfare criteria have been published by the Federal Environmental Protection Agency, and these criteria can be compared to the noise levels quantified in this Element to draw some general conclusions. The basic criteria are given in Table 8.3, and utilize the Sound Equivalent Level (L/eq) and Day-Night Noise Level (L/dn). The L/eq is the basis for the L/dn noise level, but

does not include a weighting for nighttime noise. It should be noted also that an "adequate margin of safety" has been built into these criteria.

Table 8.2
Summary of Noise Levels

EFFECT	LEVEL	AREA
Hearing Loss	$L_{eq} (24) \leq 70$ dB	All Areas
Outdoor activity interference and annoyance	$L_{dn} \leq 55$ dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time, and other places in which quiet is a basis for use.
	$L_{eq} (24) \leq 55$ dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	$L_{dn} \leq 45$ dB	Indoor residential areas.
	$L_{eq} (24) \leq 45$ dB	Other indoor areas with human activities, such as schools, etc.

Source: U.S. Environmental Protection Agency, 1974

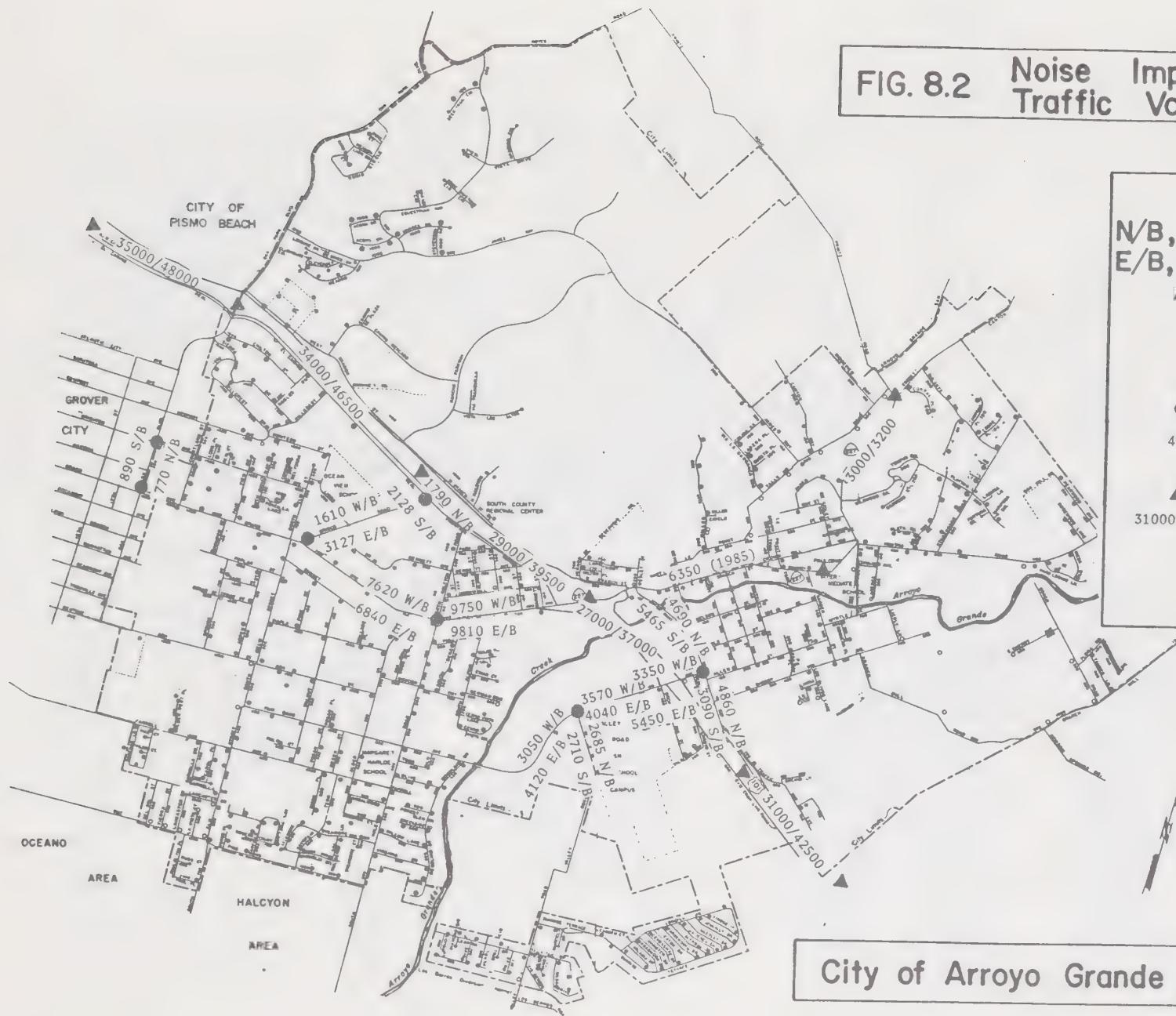
C. Future Conditions

In planning for noise control, it is necessary to consider what the future noise environment may be like. In general, the future noise environment will be controlled by two factors:

1. The expected increase in the number of noise sources, i.e. traffic volume, changes in technology and other noise sources, and
2. The application of noise control regulations of intrusive noise sources, including personal radios and car sound systems.

It is possible to assume that some noise control technology will be applied to some noise sources, and that this may counterbalance the increase in traffic, resulting in the same noise levels as currently exist. No major technological breakthrough is foreseen for other noise sources, however, and the expected increase in volumes of these sources will mean an increase in noise levels. Even with the application of

FIG. 8.2 Noise Implied, Based On Traffic Volume



Legend

N/B, S/B
 North, South Bound
E/B, W/B
 East, West Bound
Freeway, Highway,
 (1984 Data from
 Caltrans Except
 Where Noted)
Streets
▲
●
432
▲
31000/32000

ADT Average Daily Traffic (24 hrs)
ADT Totals Are N/B & S/B Combined, Higher Number is for the Peak Months

City of Arroyo Grande

Noise Element

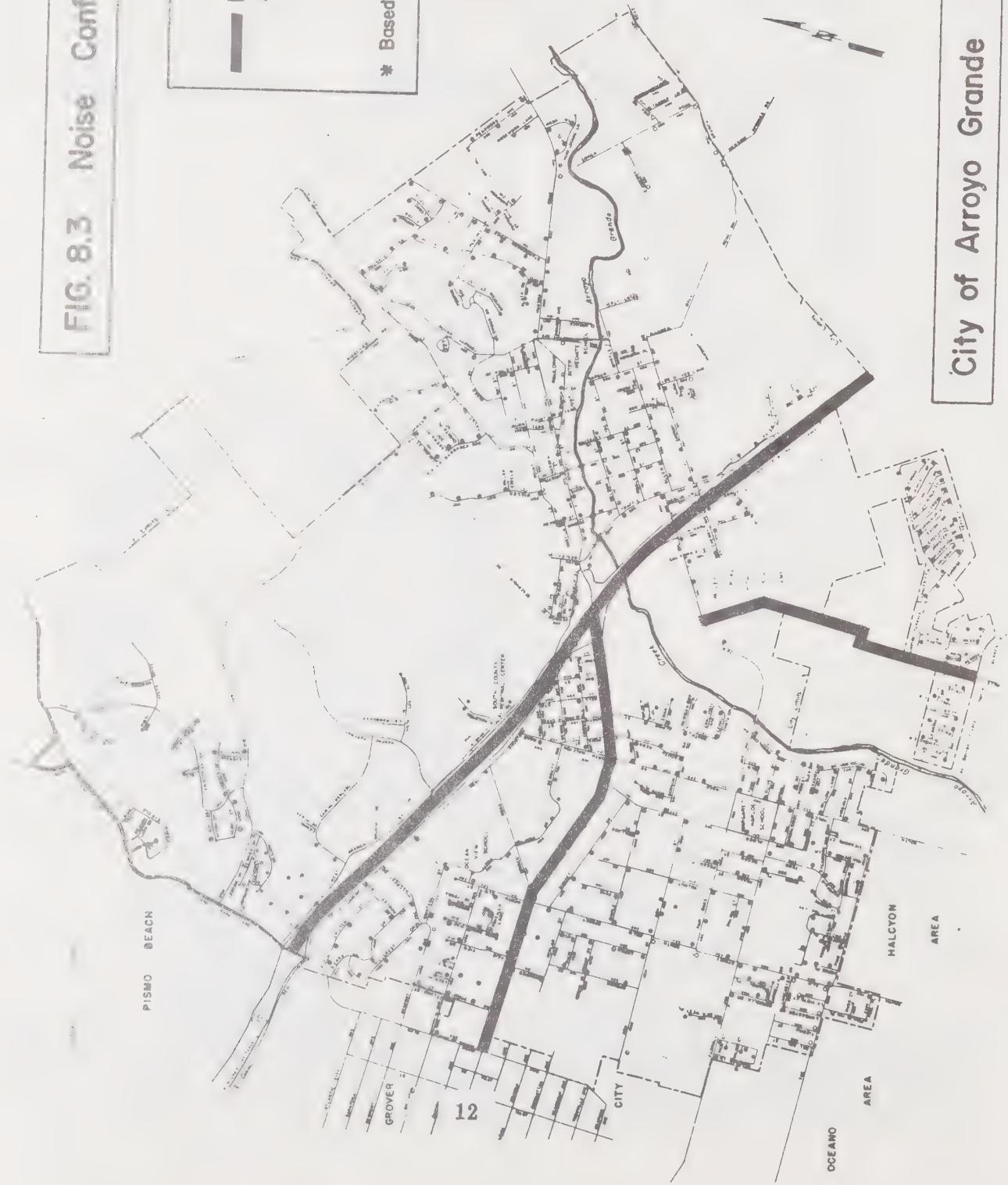
FIG. 8.3 Noise Conflict Map

City of Arroyo Grande Noise Element

Legend

— Ldn
And
Contours of 65 dBA
Higher.*

* Based on the 1975 Noise Contour Map.



technology, high noise levels are expected to persist in some areas. There are limits to what can be accomplished by technology alone, and this makes land use control a necessary component of successful noise control strategies. Summary conclusions regarding the expected future noise environment are as follows:

Street and highway traffic volumes will increase and will impact new areas. Forecasts of street traffic noise assume that noise control technology will be applied, and that this may counteract the expected increase in street traffic in some cases;

Stationary noise sources will continue to emit existing noise levels unless abatement is required by the City;

The City will continue to work toward reducing noise wherever possible; in necessary and essential work by the Fire Department, Police Department and Public Works (see Appendix 8.4).

D. Mitigating Measures to Existing and Future Noise Problems

Mitigation of noise is mandated in the Noise Element; the major mitigation measure is **directing sensitive land uses away from high noise sources and traffic noise corridors.** Some general principles are:

1. Noise sensitive uses should not be located in high noise source areas;
2. Noise sensitive uses should not be located near traffic noise corridors;
3. Where noise sensitive uses exist in or near noise sources, all mitigating measures should be investigated which will reduce or eliminate the noise.

Possible mitigations include:

1. Consider noise from Highway 101;
2. Limit development on Grand Avenue to commercial uses and protect adjacent residential areas from noise by use of barriers, walls and baffles. Commercial buildings may be limited to a single story at the rear of the lot to protect residential areas from reflected and amplified noise;
3. Direct new development of noise sensitive uses away from highways and arterials (hospitals, convalescent centers, long-term medical or mental care facilities, group homes, schools - both public and private, etc.);
4. Require insulation in high noise areas which meet the California Code, Title 25 standards. Title 25 of the California Administrative Code requires all new multi-family housing to have an acoustical report prepared. This report will be prepared to demonstrate interior sound levels of 45 CNEL or less, where site is within areas of 60 dB CNEL or higher levels. An interior L/dn of 45 dB, therefore, also becomes a criterion for;
5. Consider areas in traffic corridors; including Highway 227
6. Encourage existing noise sensitive uses which are adjacent to arterials to install berms, trees and/or other devices to reduce noise;
7. Encourage upgrading of existing buildings in high noise areas to present standards for windows and insulation;
8. Continue program to upgrade City building and vehicles, i.e. slumstone pump house replacements, lower noise level vehicles and equipment. Monitor work and workers;
9. Cooperate with Caltrans and work for Caltrans installation of devices to reduce noise to existing residences adjacent to Highway 101 (trees, berms

but not walls, etc.) (Bennett/Barnett, Winton/Vernon, Orchard/Cherry, Chilton/Robles neighborhoods).

As traffic volume data is amassed each year for City intersections, the data should be added to Figure 8.2 in this Element and to Figure 3.2 in the Circulation Element (Figure 3.2, Traffic Volume, in the Circulation Element, presents 24-hour traffic statistics for highways and specific intersections). Volumes on Highways 101 and 227 were compiled by Caltrans in 1984 and 1985; volumes on City streets were compiled by the City Public Works Department in 1985. Traffic volume data indicates noise from traffic corridors. Traffic volumes do not define the noise level or the day/night weighting of noise factors as do noise monitoring and noise contour mapping (see Figure 8.2, Noise Implied Based on Traffic Volumes). A current noise contour map should be added to this Element as soon as it is available. The 1975 contour map is available in the City Building Department.

E. Effects of Noise

Noise affects people and their environment in a number of important ways. Animals and humans react involuntarily to sounds, even sounds which are not noticed on a conscious level. Other sounds are intense and quick enough to rupture the eardrum. However, all sound is not destructive. The point should be emphasized that sound is vital to communication and necessary for the maintenance of life.

As sound levels increase, they quickly reach levels which can be detrimental to health and well-being. However, like most human characteristics such as eye color and vision acuity, hearing ability is distributed "normally" in a population. That is, there are a few people with extremely sensitive hearing, and a few people with extremely poor hearing ability. Most people, however, have hearing abilities between these extremes. This is an important concept to remember while reading the following sections on the effects of noise. Not all people are subject to experiencing these effects to the same degree. In short, the effects of noise are subjective, and this has an important bearing on ordinances enacted by cities and governments which set noise standards.

The effects of noise may be thought of as falling into four categories: physical, psychological, social, and economic. The lines between the categories are not established; there is much overlap. As research in acoustics and human response to sound progresses, the effects of noise will be more completely defined. This discussion is intended to be a brief summary of existing knowledge.

1. Physical: The most serious physical effect of noise is damage to hearing, and the most tragic damage to hearing is a permanent shift in the hearing threshold (termed permanent threshold shift or PTS). Once the cells of the inner ear are ruptured or otherwise damaged, there is no known way to repair them. The cells do not regenerate. To persons intermittently exposed to high noise levels, the hearing threshold may be shifted temporarily (termed temporary threshold shift or TTS). Most of us have experienced TTS at some time, for example, when a firecracker explodes or a loud, sharp noise occurs nearby. For awhile, we cannot hear sounds at lower intensities. While the ear eventually recovers from this kind of damage, TTS can be a significant problem to persons frequently exposed to noise.

Besides the physical effect on our hearing, noise can induce a number of other physiological reactions. Environmental or community noise is of concern because of its non-auditory effects. Community noise is usually not intense enough to affect hearing.

The most important effects of community noise are its effects related to stress. Noise is one of the principal urban stresses experienced on a daily basis. The body interprets noise as a form of stress and reacts to stress. Most of the responses are produced by the involuntary nervous system. The individual may not be consciously aware that his/her body is under stress and that nervous reactions are occurring. Furthermore, the individual may not be aware that noise is the source of stress even if he/she was aware of the stress in the first place.

Reactions to noise are similar to reactions to intense emotional states, such as fear or anger. Some of the responses are (1) an increase in blood pressure, (2) an increase in heart rate, (3) dilation of the pupils, (4) increase in blood cholesterol, (5) increase in hormone levels by endocrine glands, (6) change in the rate of acid secretion by the stomach, (7) increase in sweat gland activity, and (8) increase in respiration. These responses can lead to increases in heart disease, ulcers, tension, hypertension, and allergic reactions. It has been documented that sounds affect the fetus before birth. Even relatively low levels of noise in the mother's environment can cause the heart rate of the fetus to increase significantly. Noise can be responsible for headaches and daily fatigue. Noise may affect health adversely only if we are exposed to high levels for long periods of time, but it can impair our well-being through the kind of effects listed above at levels commonly experienced in urban areas (see Appendix 8.2 relating to industrial noise and hearing damage risk).

The effects of noise discussed previously are produced by sounds in the audible frequency range. Mention should also be made of two categories of sound which cannot be heard - "ultrasonics" and "infrasonics." Ultrasonics refers to the range of sounds above 20,000 Hertz (Hz) or wave cycles per second, the upper limit of human hearing. A dog whistle is a common example of a device which produces ultrasonic frequencies. Infrasonics refers to frequencies below the audible range, that is, below 16 Hertz (see Appendix 8.3).

Noise affects animal behavior in ways similar to human behavior. Unfamiliar noises can disrupt population dynamics and individual growth behavior. A single startle can stop the brooding cycle of wild game birds. Continuous noise can mask predator-prey signals, inducing huddling, panic or migration. Animal ears are subject to similar kinds of physical damage as human ears. Loss of hearing because of noise exposure has been documented in a number of laboratory cases with a variety of species. Animals also react to noise as stress which produces neural and hormonal changes affecting urinary, adrenal and reproductive functions. In the wild, these effects can significantly alter the "natural balance" between various species and between species and their environment.

Domestic animals may suffer more since they have limited mobility, cannot "escape" noise and are usually closer to urban areas. Farm animal productivity may be diminished, and mortality rates can be increased, as well. The economic impact of these effects would make further study in this area worthwhile. The point to be made is that noise impacts the animal population in ways similar to the human population. Animal populations have adverse reactions primarily to unfamiliar noises. Animals demonstrate an ability to adapt to a noise over time if it is learned that the noise is not associated with direct harm.

Noise also affects inorganic material; the example of high pitched sound resonating and shattering glass is well-known. Structural damage by noise is usually moderate, however, even in sonic booms. Glass and plastic are the materials most susceptible to damage by noise. Temporary vibrations may be induced in various kinds of structures, particularly buildings, by noise as well. Structural response to sound is

highly variable, however, and most damage is usually concentrated in secondary structural materials, such as glass, stucco or plaster.

2. **Psychological:** Many behavioral responses to noise are rooted in the involuntary physiological reactions. The two most serious psychological effects of noise are interference with sleep and speech. Data on interference with sleep shows that this response is more subjective than interference with speech, but generally, noise levels will begin to interrupt or impair sleep in the 40 to 45 dBA range (Figure 8.2). Noise acts on the body when it is asleep in the same manner as it does when the person is awake. The ear does not mask noise during sleep. Even if noise levels do not awaken a person, they can interfere with dream stages, shifting a person from a deeper dream stage to a more shallow one. Any disruption of deep-stage dreaming is thought to impair mental health and well-being. Loss of sleep is known to impair a person's ability to carry on normal daily tasks, especially those requiring short-term memory or high-speed processing of information. Severe deprivation of sleep can create frascibility and mental disorganization, causing dreaming while awake, hallucinations, and other behavior bordering on temporary mental illness. It is important to remember that noise can disturb the rest of sleeping persons, whether they are aware of the noise or not. It is difficult to distinguish between physical and psychological effects of noise.

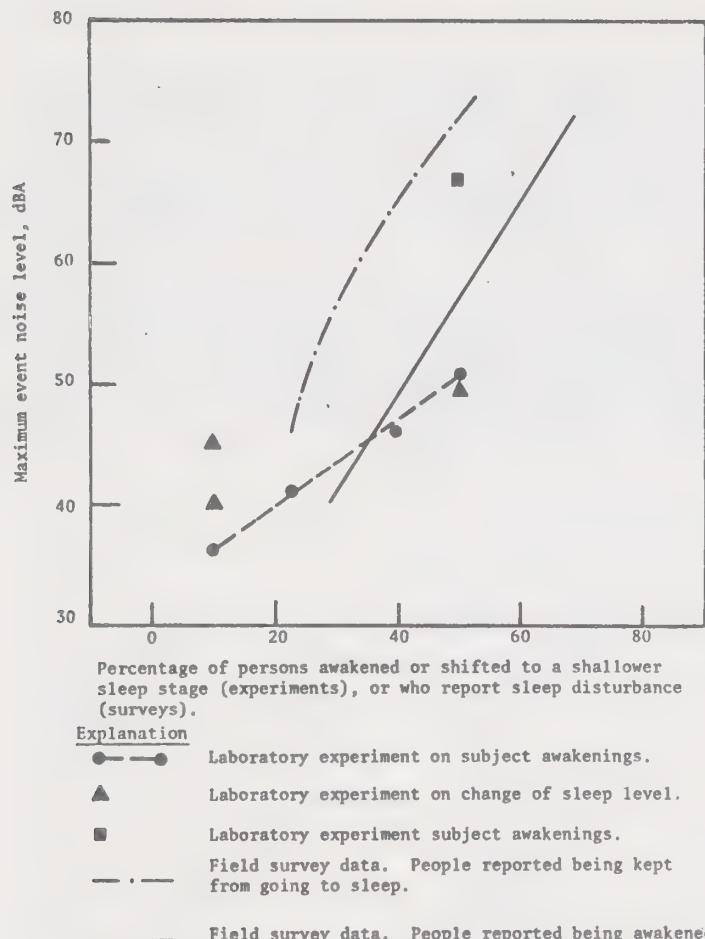
Interference with speech depends, of course, on how far the people are from each other, the level of their voices and other parameters. The understandable reception of voice sounds in ordinary conversation is usually interfered with at the level of 50 to 60 dBA. The social costs of interference with speech can be of great magnitude and are discussed below. The behavioral impacts of speech interference include impairment of leisure activities needed for stable human behavior, and irritability when conversations must stop until the noise decreases. Noise also interferes with concentration and the ability to perform tasks.

Exposure to noise alone does not cause mental illness or breakdown, but it is true that exposing a depressed individual to noise is not productive to healing. A famous English study reported in 1969 that individuals closely exposed to the noise of London's Heathrow Airport had higher admission rates to mental hospitals than people living farther from the noise. Such evidence warrants further investigation. Noise, as an additional form of unwanted stress, can provide the added stress which brings on emotional crises.

3. **Social:** The reactions of groups and communities to noise are similar to the reactions of individuals. It is clear that noise interferes with social processes. Its foremost effect is to disrupt the ability of people to communicate with one another. Communication by sound is vital to almost all human social behavior, and its impairment should not be underestimated. As an important example, consider educational processes. Children who attend school near sources of loud noise can have their learning and socialization processes severely handicapped. Several schools in Westchester were forced to close down because the noise near the Los Angeles International Airport interfered seriously with hearing, learning and teaching. The effects of noise on other social processes can be equally as serious.

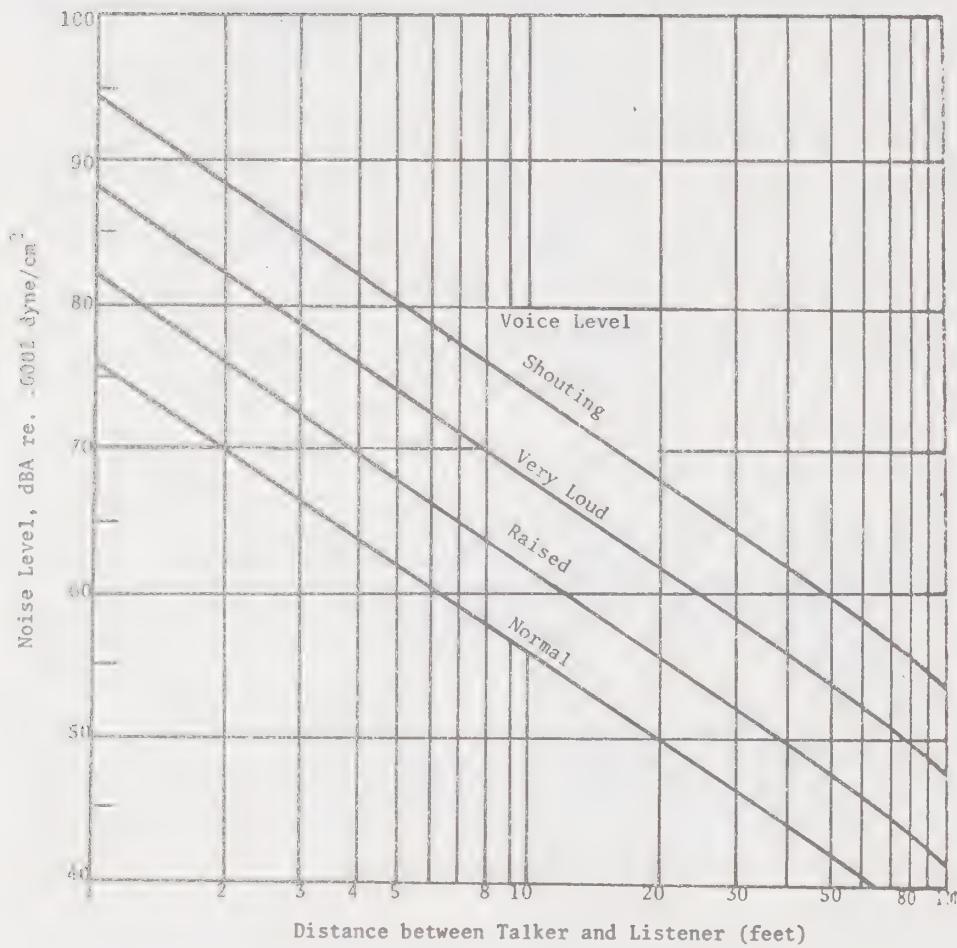
4. **Economic:** The most prevalent economic effect of noise is the reduction of residential property values near the source of noise. This document does not examine specific property values, but a comparison of residential property values near Highway 101 with residential property located away from these sources may bear this out.

Figure 8.4
Noise-Induced Sleep Disturbance Data



Source: Wyle Laboratories, 1973.

Figure 8.5
Distance Between Talker and Listener



Source: Wyle Laboratories, 1973

Another kind of major economic cost of noise is noise-induced inefficiency in the labor force. Noise interferes with the performance of tasks; such interference causes business and industry to lose income through lost output. The costs of insulating environments and muffling sources should be included as economic costs. Economic costs of noise are among the most difficult to calculate, however, because they are associated with the psychological states of stress discussed above. The effects have yet to be quantified adequately by economists.

F. Conclusion

Arroyo Grande is not a high noise level city; the major noise source is traffic on Highway 101, Highway 227, Grand Avenue and other City streets. Vehicles are now manufactured with quieter components than 1976, the result is less noise per vehicle. However, due to the increase in the number of vehicles, the noise level has not decreased in traffic corridors. Also, loud car and truck sound systems add to the increase in irritating urban sounds.

The City must continue to evaluate noise and land use issues, to protect neighborhoods near traffic corridors and to work for upgrading existing buildings to current noise standards. Most important of all, the City must be consistent in siting new noise sensitive land uses (medical care and hospitals, schools) away from traffic corridors. The tools to achieve this are zoning, development standards, State and City building requirements, and protection in the Land Use Element.

V. GOALS, POLICIES AND PROGRAMS

GOAL A: MINIMIZE EXTERNAL NOISES AND PREVENT THEM FROM PENETRATING QUIET AREAS

Policy A: Consideration of noise factors to be a part of land use planning and environmental review.

Program 1: Consider noise in all land development action:

- a: zoning
- b: subdivision
- c: conditional uses

Program 2: Require an interior noise level of 45 dB for new multi-unit buildings in impacted areas which meet Title 25, California Code standards.

Program 3: Consider areas in traffic corridors. See Figure 8.3, Noise Conflict Areas.

Program 4: Consider noise from Highway 101.

Program 5: Encourage upgrading of existing buildings in high noise areas to present standards.

GOAL B: PROVIDE A BASE FOR NOISE EVALUATION IN LAND USE CONSIDERATIONS

Policy A: Noise sensitive land uses, such as schools, hospitals and convalescent centers, shall be located with regard to noise criteria.

Program 1: Utilize zoning ordinances which set noise sensitive areas apart from traffic corridors.

Policy B: Residential land use shall be located with regard to noise criteria with special protection for all homes.

Program 1: Utilize zoning ordinances which set residential areas apart from traffic corridors.

GOAL C: ABATE BOthersome OUTDOOR NOISE

Policy 1: Enforce construction activity time limitations.

Program 1: Limit construction time from 7 a.m. to 7 p.m.

Policy 2: Encourage quieter equipment and vehicles.

Program 1: Continue to evaluate the noise levels of existing and new City machines and vehicles.

Policy 3: Enforce present noise ordinances, add others as needed.

Program 1: Evaluate present noise ordinances for vehicle and fixed point sources.

Program 2: Add ordinances regarding moving noise sources.

VI. PROJECT IMPLEMENTATION (1985 - 1990)

ONGOING PROJECTS

Noise Sensitive Land Use Policy: No policy; concern only.

Title 25: Used where appropriate, insulate per CA Code requirements.

Residential: Allowed adjacent to highways and major arterial.

Land Use: Per General Plan and zoning maps.

Schools: Constructed prior to CA Code Title 25.

Public Works: Continue program to use/purchase lower noise level vehicles and equipment. Monitor work and workers.

Caltrans: Noise survey exists; however, no 1983-86 data.

Noise Ordinances: In effect.

Construction: 7 AM to 7 PM.

Zonings: All zones except C-1 flank Highway 101. Grand Ave. had been various zones, now all are zoned C-2 (retail) (1986)..

Commercial/Residential Zoning/Conflicts: Use of fences OR walls between commercial and residential.

This section should be reviewed annually by the City Manager and the appropriate department directors. The entire element shall be reviewed and updated in years ending in 0 and 5.

SPECIFIC PROJECTS

Noise Sensitive Land Use Policy: Direct NSLU away from traffic corridors. Use Zoning and Land Use Element.

Title 25: Building Inspector may require acoustical report. Insulate per CA Code requirements to an interior noise level = 45 dB for multi-unit residential.

Residential: Consider rezone.

Land Use: Prohibit noise sensitive land uses in impacted traffic corridors (Hwy. 101, Grand Ave., Hwy. 227) (55⁺ dB CNEL).

Schools: Encourage insulation upgrading for existing public and private schools in impacted area.

Public Works: Complete pump house replacement program to reduce noise. Monitor work and workers. Use safety and soundproofing equipment.

Caltrans: Coordinate with and work for installation of noise reduction devices adjacent to Hwy. 101 (existing neighborhoods).

Noise Ordinances: Add ordinances as needed.

Construction: Continue time limitations.

Zonings: Retain C-2 zoning for Grand Avenue.

Commercial/Residential Zoning/Conflicts: Protect adjacent residential from reflected and amplified noise. Use of slumstone solid walls, baffles, barriers and trees.

NOISE ELEMENT

List of Resources

Arroyo Grande, 1974 Noise Element San Luis Obispo County, 1974 Noise Element

Arroyo Grande Police Department
Arroyo Grande Fire Department
Arroyo Grande Public Works Department

Arroyo Grande Building Department

Caltrans, Transportation Planning
California Highway Patrol
City of San Luis Obispo
City of Santa Maria
San Luis Obispo County
San Luis Obispo County Health Dept.
South County Sanitation District

Noise Element Guidelines, 1976
California Noise Guidelines, 1976

Motor Vehicle Noise Report, 1973

Santa Maria Noise Element, 1986
Santa Maria Technical Appendix

General Plan in the Mid-'80's

Chief James Clark
Chief Doug Hamp
Dwayne Chisam
Thom Head
Laraine Kashima
Director John Richardson

Fred Miller, Transportation Planner
Max Van Orsdel, Area Commander
Staff
Staff
Frank Heinsohn, Environmental Planner
Staff
Staff

Office of Planning and Research
Office of Planning and Research

California Assembly
Committee on Transportation

Curtin and Mintier

Appendix 8.1

California Vehicle and Administrative Codes

California Vehicle Codes 27200, -201, -202, -204, -206 and -207 relate to road inspection and test procedures which may be used by the California Highway Patrol (CHP). Vehicles in California are limited to 80 Dp per unit.

California Codes 27150 and -151 refer to regulations of sale of new X-type vehicles and restrictions on modifications.

California Administrative Code Title 13, Section 1030 covers the implementation of the Vehicle Code cited above. Manufacturers have reengineered vehicle components based on this legislation.

No changes in catalytic converters are permitted; changes violate both State and Federal law. Also, no automotive or motorcycle amplifiers are sold in California.

The problems which persist are related to the number of units, signalization, non-mechanical accessories (radios, etc.), traffic stacking and time.

Source: Area Commander Max Van Orsdel
San Luis Obispo office, CA Highway Patrol

Appendix 8.2
Hearing Damage Risk Criteria

Duration per Day, Hours	Sound Level, dBA
8	90
6	92
4	95
3	97
2	100
1-1/2	102
1	105
1/2	110
1/4 or less	115

Source: Walsh-Healy Public Contracts Act of 1969 and Occupational Safety and Health Act of 1970 (OSHA)

These criteria are designed to regulate noise levels in industrial settings. These tables reflect on duration of time over a period of years. In order to meet the OSHA criteria, a person would have to remain in the noise environment eight hours (or longer) daily for a period of several years.

These tables are appropriate for use in industrial settings, oil fields, national or international airports or the equivalent noise environment in other businesses.

Appendix 8.3 Ultrasound and Infrasound

For years, ultrasound has been used in medicine to treat asthma, cystic fibrosis, and other respiratory ailments, and in a variety of ways to clean small instruments, jewelry, tools, dentures, etc. As useful and common as ultrasound is, it is known to be hazardous if improperly applied. It specifically should not be directed at areas of poor blood circulation or cancerous infection. The presence of ultrasound in the ambient urban atmosphere is generally insignificant compared to audible frequencies, but it should be noted as a potential health hazard.

Infrasound is less familiar to most people, and research into the world of infrasonics is relatively recent. These low frequency pressure waves seem mostly to act on the internal organs - the heart, lungs, and viscera - by vibrating them. The resonance creates dizziness, nervous fatigue, and seasickness. A frequency of 7 Hz has been found to be fatal at high enough intensities. Infrasound has been measured in the everyday ambient atmosphere in Washington, D.C. Identified sources are large-scale natural events, such as tornadoes in Oklahoma, an earthquake in Montana, and magnetic storms in the upper atmosphere. A large number of sources remain unidentified; one common source of infrasound is large industrial ventilation systems. Infrasound must be considered part of the urban environment.

Source: Arroyo Grande Noise Element, 1975

Appendix 8.4
State Highway Noise and Sound Walls

Records exist for noise generated on State highways. However, no records exist in the 1980-1986 time period, as Caltrans is no longer making noise studies at this time.

If a jurisdiction requests sound walls to protect residents living adjacent to a California highway, it is necessary to hire a private consultant or acoustical engineer to determine the problem, assemble the quantifiable data collection, do the analysis and present a final report.

Source: Fred Miller, Caltrans Planner, District 5

Appendix 8.5 Municipal Specifications

The Public Works Department has begun the implementation of CAL OSHA's Occupational Noise requirements as outlined in the General Industry Safety Orders, Title 8.

Equipment and work sites have been monitored for time weighted noise averages to determine the necessity for hearing protection and/or monitoring of employee hearing levels.

Specifications for new equipment require noise reduction modifications to assure minimal noise production. Old equipment is modified to reduce noise pollution, or hearing protection is required and provided.

Construction of slumpstone pump house buildings is in progress to minimize noise and vibrations. The Public Works Department will continue to take any appropriate action to protect the hearing of its employees.

The Fire Department has provided firefighters with protective industrial ear covers for use in working with specific fire equipment.

Sirens which are used only in emergency situations exceed the City noise standards, but are exempt due to need and temporary time limits.

The South County Sanitation District garbage pick-up service, contracted by this district for the City of Arroyo Grande, does not start service prior to 6 AM.

Appendix 8.6 Glossary

Ambient Noise: The level of noise that is all-encompassing within a given environment, being usually a composite of sounds from many and varied sources near to and far from the observer. No specific source is identified in the ambient.

Community Noise Equivalent Level (CNEL): The CNEL in dBA is the adjusted noise exposure level for a 24-hour day. It is a noise measurement scale which accounts for noise source, distance, single event durations, single event occurrence frequency and time of day. It is a combination of separate daytime, evening, and nighttime equivalent noise levels with weighting factors applied to evening and nighttime values. The adjustment approximately accounts for the lower tolerance of people to noise during the evening and nighttime periods relative to the daytime period.

A-Weighted Sound Pressure Level (dBA): A method of sound measurement which assigns weighted values to selected frequency bands in an attempt to reflect electronically how the ear responds to sound. The A-Weighted Sound Pressure Level (dBA) is a quantity in decibels read from a standard sound level meter that is switched to the weighting network labeled "A." The "A" weighting network discriminates against lower frequencies according to a relationship approximating the auditory sensitivity of the human ear at moderate sound levels.

Day-Night Average Sound Level (L_{dn}): A combination of daytime and nighttime "A" weighted noise levels with the nighttime values weighted further to account for the lower tolerance of people to noise during the nighttime period relative to daytime period. L_{dn} is approximately 1/2 dB lower than the estimated CNEL value, and can be considered synonymous with CNEL.

Noise Attenuation: The attenuation of a material substance or medium refers to its ability to reduce the noise level (acoustic) from one position to another. Noise attenuation can be specified, in decibels, as a noise transmission loss.

Noise Contours: A line connecting equal levels of noise intensity as measured on a particular scale, such as L_{dn}.

Noise Impacted Area: Area affected by unusually high levels of noise. Generally, a criterion level is stated in decibels which has been weighted for frequency and time, e.g. CNEL 65, L_{dn} 65.

Noise Sensitive Land Uses: The more sensitive land uses include residential, schools, libraries, churches, hospitals, convalescent centers, auditoriums and outdoor recreation areas. These typify land uses whose suitability is restricted by intrusive noise, hence are termed "noise sensitive." Noise sensitivity factors include interference with speech communication, noise acceptability and relative noisiness, need for freedom from noise intrusion and sleep interference criteria. Also considered is compatible building construction.

Nomographs: Nomographs of highway noise contours provide noise level estimates for various traffic volumes.

Performance Standards, Noise: Measured criteria for maximum emission of noise from a fixed point source. Noise performance standards for stationary land uses are usually applied at the lot line.

Statistical Level (L₅₀): The L₅₀ statistical noise level is exceeded 50 percent of the time during which the measurement was made.

ARROYO GRANDE PLANNING DEPARTMENT

Participating Staff

Stanley A. Eisner, A.I.C.P., Director of Planning

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Appendix 8.7
Resolution Adopting the
Noise Element

RESOLUTION NO. 1978

**A RESOLUTION OF THE COUNCIL OF THE CITY OF
ARROYO GRANDE ADOPTING A REVISED NOISE
ELEMENT OF THE GENERAL PLAN**

WHEREAS, Section 65302 (b) of the California Government Code directs all cities and counties to prepare a General Plan Noise Element; and

WHEREAS, the City has determined that it is appropriate and necessary to update and revise previous noise plans adopted by the City; and

WHEREAS, the Planning Commission and City Council have held public hearings on a new Noise Element in accordance with the California Government Code and General Plan Amendment regulations of the City; and

WHEREAS, the Planning Commission and City Council have considered public testimony and technical information prepared by staff covering goals, policies, and programs and including 1975 analysis of noise in traffic corridors and the City; and

WHEREAS, the City Council has considered mitigating measures, including land use restrictions; and

WHEREAS, the Noise Element incorporates programs aimed at providing for protection of noise sensitive land uses; and

WHEREAS, the City Council intends to reexamine the Noise Element periodically to evaluate the effects of programs and to consider new information.

NOW THEREFORE BE IT RESOLVED BY the Council of the City of Arroyo Grande as follows:

- (1) The Noise Element of the City of Arroyo Grande General Plan, as required by California Government Code Section 65302 (b) is adopted;
- (2) The Planning Department shall publish and make available to the public said element and shall distribute copies to appropriate members of City government, to the California Office of Planning and Research, other appropriate agencies, the Administrative Center and South County libraries;
- (3) The Noise Element adopted in 1976 is rescinded;
- (4) The adoption of this element shall take effect thirty (30) days from the date of adoption of this resolution.

On motion of Council Member Johnson, seconded by Council Member Porter, and on the following roll call vote:

AYES: Johnson, Porter, Moots, Gallagher

NOES: None

ABSENT: Smith

The foregoing resolution was passed and adopted this 22 day of July, 1986.

U.C. BERKELEY LIBRARIES



C124890242

